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MEMORANDUM REPORT

M62-12-1

EXPERIMENTAL LONG TERM STORAGE REPORT

TEARDOWN INSPECTION OF

M8 RECOIL MECHANISMS FOR 240 mm HOWITZER

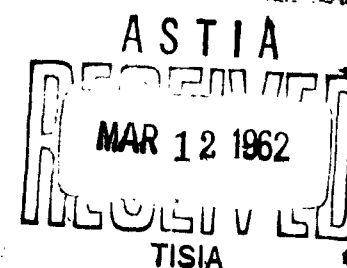
AT ROCK ISLAND ARSENAL, NOVEMBER 1958

by

W. J. SHIELDS

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REPORT

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Report M62-12-1



FRANKFORD ARSENAL

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## ABSTRACT

Examination of six M8 recoil mechanisms, removed from 240 mm howitzers after 14 years of storage in air maintained at 40 percent relative humidity maximum, revealed all the mechanisms to be in an excellent state of preservation. Externally, there was no evidence of deterioration. Internally, light rust was found on the recoil and counter recoil rods and recuperator valves of all units. Since the rust was readily removable by wiping with a soft cloth, the serviceability of the recoil mechanisms would not be impaired. The cause of this superficial rusting was not determined.

Laboratory analysis of oil and grease samples removed from the units were found to meet all of the originally specified requirements. The coil springs in two of the floating pistons, in separate units, were found broken.

## INTRODUCTION

The Experimental Long Term Storage Program was established by the Ordnance Corps to determine the practicability of storing completely assembled serviceable materiel in metal containers under all types of climatic conditions. A wide variety of Ordnance materiel was selected for storage in the program and various methods of storage were employed. The particular method used for the storage of any item of materiel was determined by several factors; e.g., cost, availability of the item for service after storage, and transportability of the item in the stored state.

Among the items stored were six completely assembled 240 mm howitzers. Because of their mass and size, the weapons were stored in fixed, large steel containers at the Aberdeen Proving Ground Storage site. The atmosphere in each container was maintained at 40 percent, or lower, relative humidity.

This report is concerned with the teardown inspection of the six recoil and counter recoil mechanisms from these weapons after fourteen years of dormant storage.

### Materiel

Six each 240 mm howitzer M8 Recoil Mechanisms, Stock No. 0031-1030-718-0343.

<u>Serial No.</u>	<u>Igloo No.</u>	<u>Humidity Control Method</u>	<u>Maximum Humidity Level Maintained</u>
308	1	Dynamic	40%
456	2	Dynamic	40%
314	3	Static	40%
208	4	Static	40%
318	5	Static	40%
310	6	Static w/solar radiation breathers	30%

## PROCEDURE

The recoil mechanisms were inspected externally for corrosion, paint failure, leakage of hydraulic oil and gas pressure. The nitrogen gas pressure was reduced to ambient, and hydraulic oil was drained prior to disassembly.

Samples of the hydraulic oil were obtained from each recoil and recuperator. After disassembly, a sample of grease was obtained from one of the floating pistons. The oil and grease samples were analyzed at the Rock Island Arsenal laboratory for compliance with the original requirements of Specifications AXS-808 and AXS-781, respectively.

## RESULTS

No evidence of paint failure or rust was found on the external surfaces of the cylinders. Light surface pitting of the recoil rods was observed outside of the stuffing box zone. There was no evidence of oil leakage from any of the recoil or counter recoil cylinders. The gas pressure in all the counter recoil systems was within allowable limits under the temperature conditions which existed at the time of observation.

On disassembly of the mechanisms, all rods, valves, and cylinders were found very lightly coated with rust. (See Figures 1 thru 6). This rust was easily removed by wiping with a soft cloth.

The hydraulic oil used in these recoil mechanisms (AXS 808) did not contain a rust inhibitor. A sample of this oil was removed from each of the recoil and counter recoil cylinders for laboratory analysis.

All samples were found to comply with the stipulated requirements of the specification.

36.231.C869/ORD.61

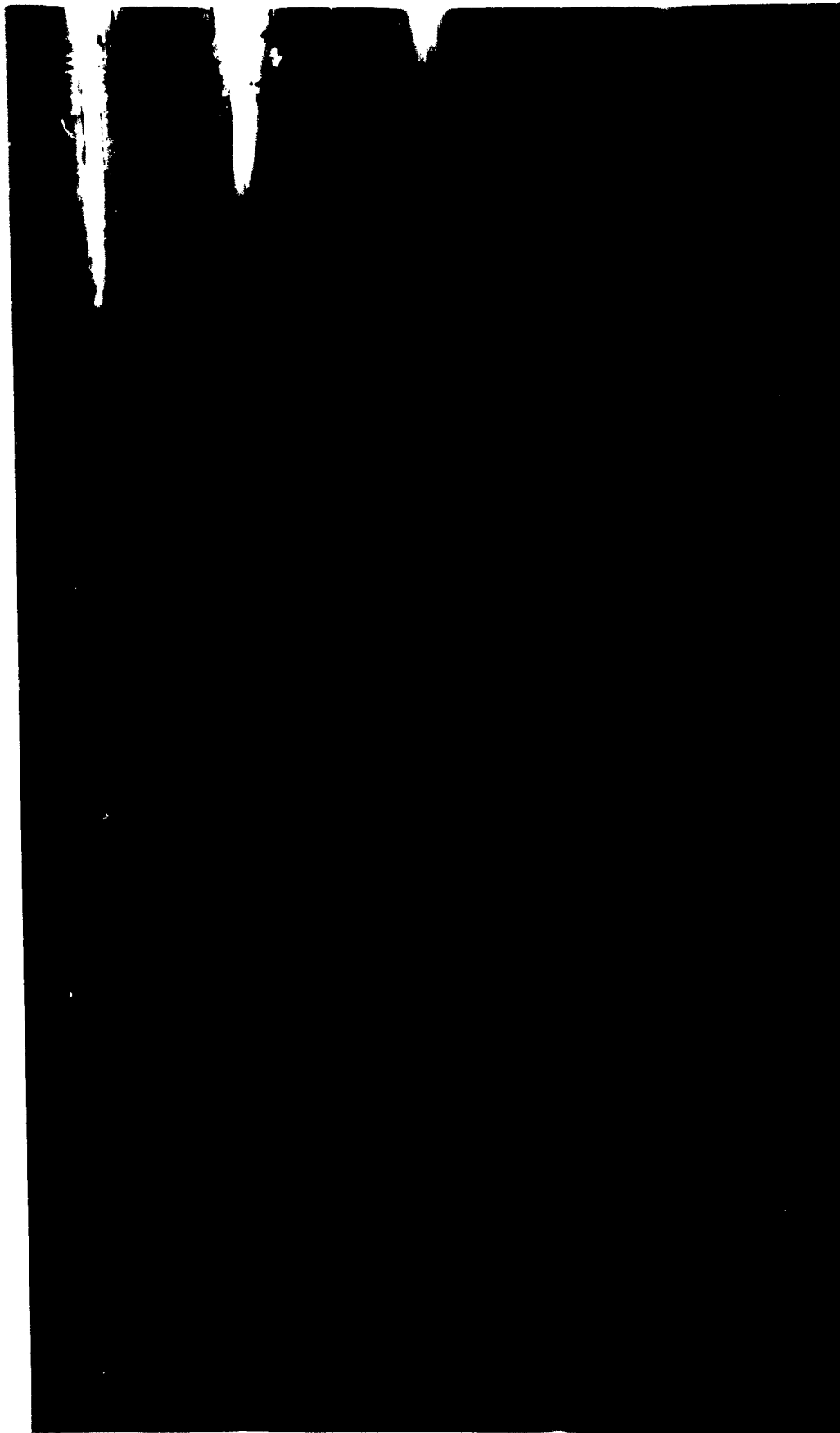


Figure 1. Recoil Rods - slight corrosion apparent



36.231.C870/ORD.61



Figure 2. Air End of Recuperator Cylinder - slight rust without etching apparent

36.231.C871/ORD.61

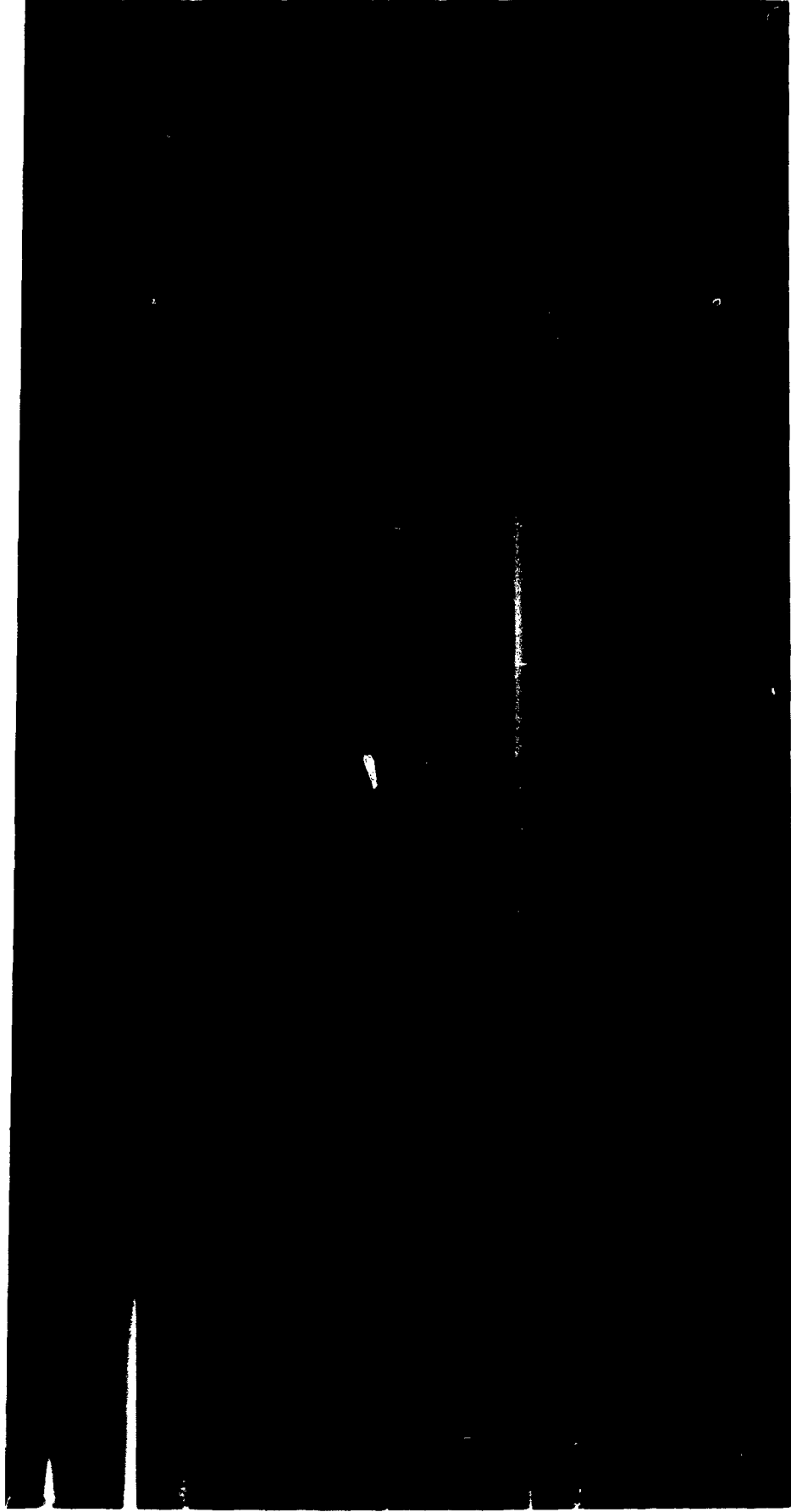


Figure 3. Counter Recoil Rods - slight corrosion and gelatinous residue apparent

36.231.C872/ORD.61



Figure 4. Regulator Bodies from two Counter Recoil Cylinders, as removed; variation in rust present in two mechanisms shown

36.231.C873/ORD.61

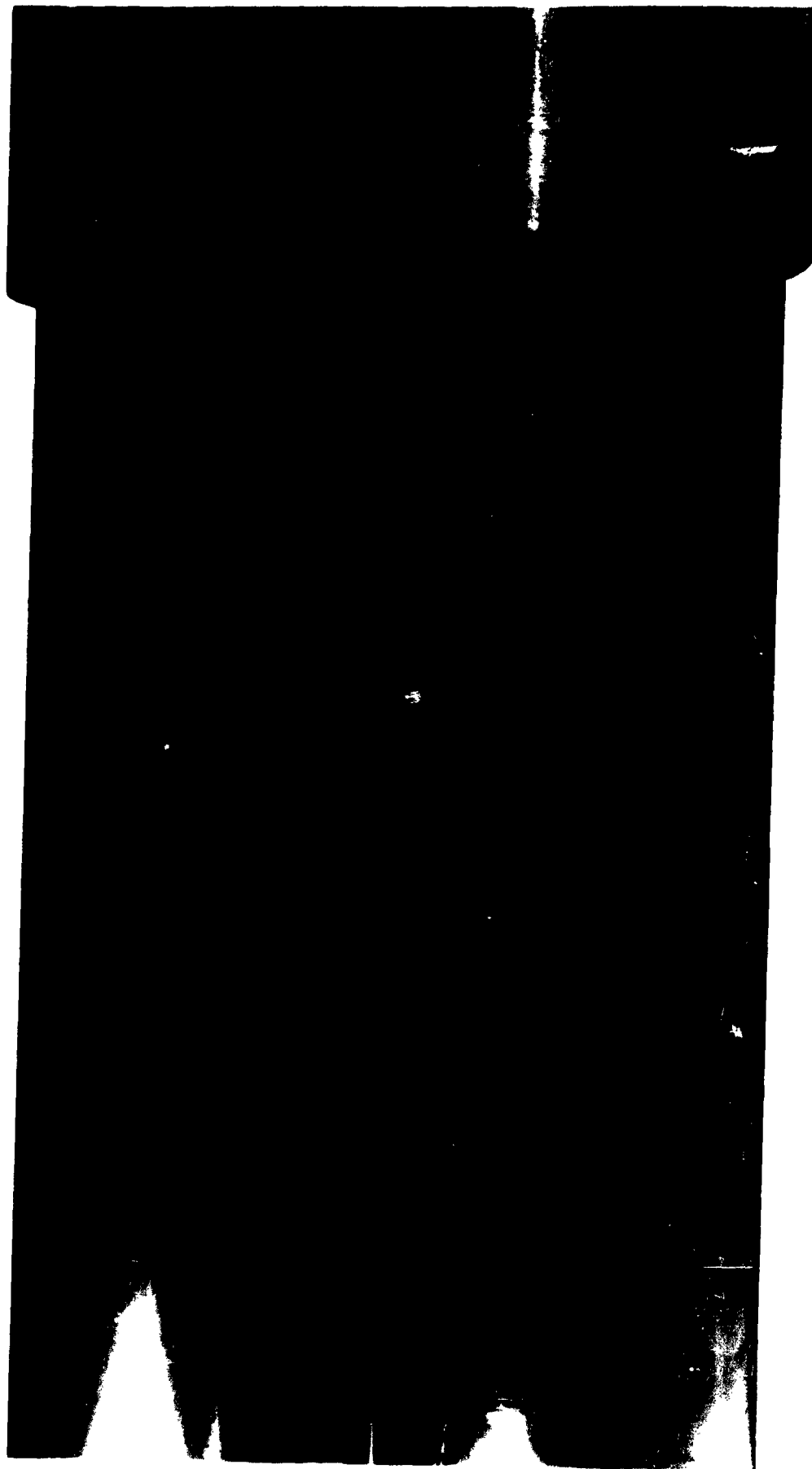


Figure 5. Recoil Rods after Degreasing - variations of rust staining

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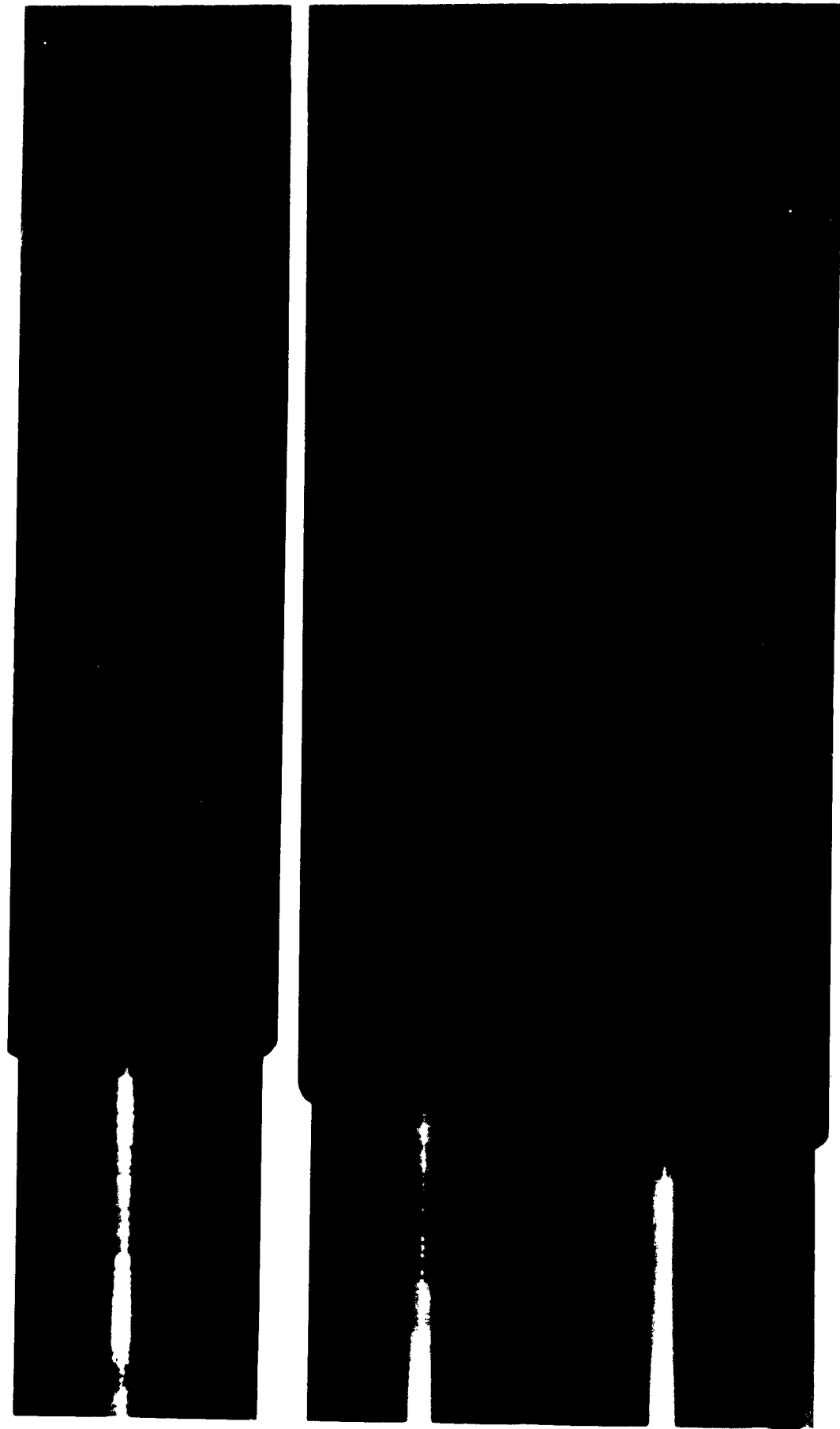


Figure 6. Counter Recoil Rods after Degreasing - some rust is removed by wiping with a soft cloth

A gelatinous residue was noted on the counter recoil rods after removal from the cylinders (see Figure 3) and a sample of this deposit was collected for analysis. It was found to contain traces of aluminum. The only source of aluminum would be the aluminum soap from the grease seal of the floating piston. All of the rods had slight to moderate rust staining. Variation in staining appeared along the length of the rods and among the rods.

The regulator assemblies from the counter recoil system (Figure 4) were found to be slightly rusted, as were the recoil rods discussed above. All regulators were rated as operable. The coil spring in each of two floating pistons was found broken; consequently, the pistons were declared defective. It was the opinion of the recoil specialists at Rock Island Arsenal that the springs were broken during acceptance proofing.

## DISCUSSION

The weapons on which these recoil mechanisms were assembled were proof-tested at Aberdeen Proving Ground, after which they were subjected to open storage for several months until the storage containers were completed.

During the 14 years of storage in the containers, a low humidity atmosphere (40 percent maximum relative humidity) was maintained. Corrosion or fungal deterioration of materials does not continue in an atmosphere at or below this level of humidity.

On external visual inspection of the recoil and counter recoil mechanisms, no failure of the method of preservation was noted. The few surface pits on the outer end of the recoil rods probably developed during the period of open storage mentioned above. The critical surfaces of the recoil and counter recoil rods, valves, any cylinder walls were not exposed to the low humidity atmosphere. They were, however, completely immersed in the hydraulic oil AXS 808 under high pressure.

The Field Service Storage Manuals require exercising of all recoil mechanisms approximately every six months. This is done to prevent the formation of rust on the critical moving components and etching of the cylinder walls. It was expected, therefore, that all rods, valves, and cylinder walls would be severely corroded after 14 years of dormant storage. Internal inspection, on disassembly, revealed variable amounts of slight rust on all rods, valves, and cylinder walls. The ease of removal of this rust from the rods indicated that it developed after proofing, since the packing in the gland would have removed all traces at that operation.

The regulator valves from the counter recoil systems show an example of variation in rust found throughout the systems. These valves are also immersed in the hydraulic oil. The valves are in a fixed location; therefore the rust could have developed at any time after assembly.

The analysis of the samples of oil removed from the mechanisms' did not offer any explanation for the corrosion observed.

Although slight rust had developed on the various internal parts of these mechanisms, all but the two mechanisms with broken coil springs in the floating piston were considered as operable by the recoil specialist at Rock Island Arsenal.

## CONCLUSIONS

Assembled recoil mechanisms can be preserved in dormant (unexercised) storage for at least 14 years in an air atmosphere maintained at a maximum of 40 percent relative humidity.

Rock Island Arsenal recoil specialists did not consider the small amount of rust found on the rods and valves of the recoil mechanism detrimental to functioning of the mechanism.

## RECOMMENDATION

It is recommended that assembled recoil mechanisms be stored in an air atmosphere maintained at a maximum of 40 percent relative humidity, for all "long" periods up to 14 years. It is further recommended that exercising of the recoil mechanisms, while in controlled low-humidity storage, be waived.



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